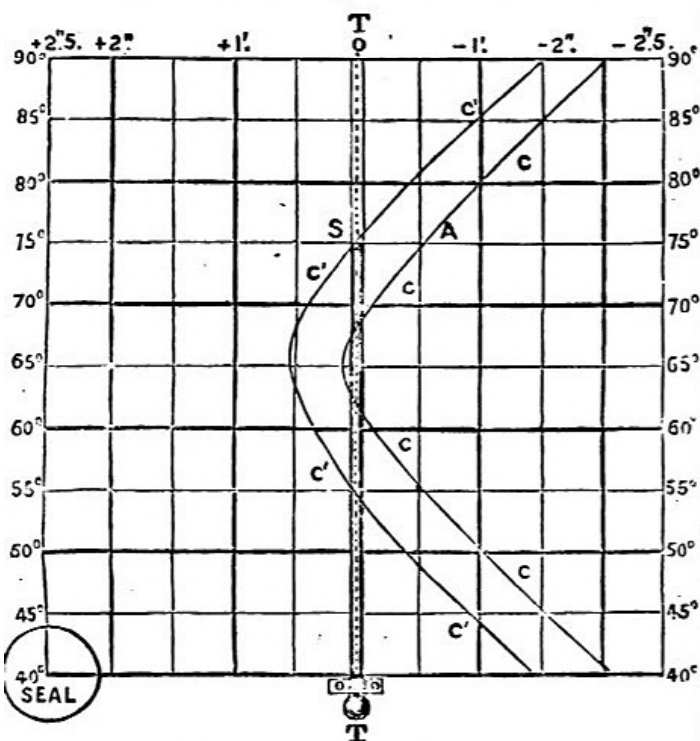


table or diagram as given below, in which T is a thermometer, C C and C' C' are curves drawn after testing the chronometer. For an ordinary voyage in which no extremes of temperature are expected, or which, if they occur, will be of short duration only, we should seal the diagram under the thermometer, so that the temperature line of 65° should coincide with and pass through the apex of the curve, and if the chronometer were neither gaining nor losing at 65° we should draw the curve as C C; if the chronometer were gaining five-tenths of a second per day we should draw the curve as C' C'.

Then the rate is always to be reckoned from the summit of the mercury horizontally till the line meets the curve; if this line should be to the left of the thermometer the time should be reckoned as *plus* (+) or *gaining*; if to the right, as *minus* (-) or *losing*.

Thus, for example, taking the line S A for a chronometer whose rate at 65° is 0° 0ths, this will give at 75° - 0° 5ths, or losing half a second daily; or for a chronometer whose rate at 65° (C' C') is fast 0° 5ths, at 75° it would be 0° 0ths for a chronometer whose daily coefficient gives a curve as here drawn.



Of course in determining a daily rate, two or more observations of temperature should be taken, so as to give a mean temperature point from which to reckon the rate, as the day and night temperatures differ considerably.

Prof. Lieusous, in his brochure, gives a rule for determining the amount which a new chronometer is likely to gain on its rate, owing to the hardness of the balance-spring and other causes independent of temperature, but we do not find this latter so reliable as the temperature-correction method as detailed above.

Should this prove interesting to your readers, we may, with your permission, at some future time give a few reasons for the difference that is found to exist between the daily coefficients of temperature of different chronometers.

PARKINSON AND FRODSHAM

4, Change Alley, Cornhill, London, March 12

P.S.—The above system renders the auxiliary compensation unnecessary, and can therefore effect a saving of 4/ to 5/ on the cost of each instrument.

#### Lowest Temperature

THERE appears to be something almost abnormal in the climatic conditions to which the observatory at Stonyhurst is subject (vol. xv. p. 399). I remember going into a garden in the neighbourhood of Knaresborough, in Yorkshire, about eight o'clock on the morning of Christmas Day, 1860, and seeing what I suppose had never been seen in England outside a laboratory before that morning, viz., the mercury in a thermometer

standing at 8° F. below zero, i.e., 40° F. of frost. At Stonyhurst on the same day the thermometer went down only to 6° 7 F., i.e., there were 25° 3 F. of frost.

Again, on March 1, 1877, the lowest temperature registered in the neighbourhood of Knaresborough was only, I believe, 18° F., whilst at Stonyhurst it was 9° 1 F. The differences, therefore, between the temperatures on the two days spoken of at these places, not fifty miles distant from each other, were respectively 2° 4 F. and 26° F., which are so wide apart as to suggest that Stonyhurst is subject to climatic conditions which do not prevail in the Vale of York. I may mention that the record in the *Times* of the temperature on the morning of March 1, was only 25° F., but in country districts in the south of England it was as low as 20° F. Great numbers of oaks, laurels, and other evergreens were killed in Yorkshire by the frost of 1860.

Oxford

R. ABBAY

#### Meteor

A FEW minutes before 10 o'clock on Saturday night I saw a very beautiful meteor towards the western horizon. The meteor passed obliquely downwards towards Orion's belt, moving slowly from right to left. When first seen it was a brilliant white body about 1/4th the apparent diameter of the moon. As it passed onwards it became bluish and pear-shaped with a bright track. Before its final disappearance between the belt and the pleiades it had a purplish hue. It was visible about four or five seconds, and during that period it traversed about ten or fifteen degrees.

Brighton, March 12

W. AINSLIE HOLLIS

I SAW the meteor at 9h. 56m. P.M. of Saturday, March 17, mentioned by your correspondent, "W. M." I was on the sea-shore at Rossall, near Fleetwood, and while looking out to sea, due west, I became aware of a sudden outburst of light on my left. On turning I saw the splendid meteor sailing rather slowly across the sky from a point about 3° north-west of ε Hydre to a point in Monoceros, whose position I should estimate to be about R.A. = 7h. 30m.; Decl. = 20° 0' south.

March 26

J. H.

#### DR. SCHLIEMANN ON MYCENÆ

LAST Thursday night will be always regarded as a memorable one in the history of the Society of Antiquaries, when Dr. Schliemann described to an unusually distinguished audience his own and his wife's explorations on the site of the Acropolis of ancient Mycenæ. Taking as his clue the well-known passage in which Pausanias (A.D. 176) speaks of the ruins and traditions of the famous Greek city, Dr. Schliemann was led to the belief that his scholarly predecessors had mistaken its drift. The passage in Pausanias runs thus:—

"Among other remains of the wall is the gate, on which stand lions. They (the wall and the gate) are said to be the work of the Cyclopes, who built the wall for Patrus in Tiryns. In the ruins of Mycenæ is the fountain called Perseia, and the subterranean buildings of Atreus and his children, in which they stored their treasures. There is a sepulchre of Atreus, with the tombs of Agamemnon's companions, who on their return from Ilium were killed at dinner by Ægisthus. The identity of the sepulchre of Cassandra is called in question by the Lacedæmonians of Amyklæ. There is the tomb of Agamemnon and that of his charioteer Eurymedon. Teledamos and Pelops were deposited in the same sepulchre, for it is said that Cassandra bore these twins, and that, when still little babies, they were slaughtered by Ægisthus, together with their parent. Hellanikos (B.C. 495-411) writes that Pylades, who was married to Electra by the consent of Orestes, had by her two sons, Medon and Strophios. Clytemnestra and Ægisthus were buried at a little distance from the wall, because they were thought unworthy to have their tombs inside of it, where Agamemnon reposed, and those who were slain with him."

Previous explorers had searched in vain for any of the relics here referred to, because they searched in the wrong place, mistaking the wall spoken of for that of the city,

struction of the large Giffard Captive Balloon within the precincts of the Exhibition. The construction will take place at all events either on public ground lent by the Government or on some private vacant space at a small distance from the Champ de Mars. The preliminary technical arrangements have been made by M. Giffard. The length of the rope will be about 600 metres. It will be conical; the largest end close to the car will be 8 centimetres diameter, the smallest end only 6. The ascending force, when loaded with ballast, guide ropes, grapnels, and 50 passengers, will be 5 tons. The weight of the cable will be  $2\frac{1}{2}$  tons when fully expended. The ascending force of the hydrogen filling the envelope will be 23 tons. The diameter of the balloon will be 34 metres, the height 50 metres from the lower part of the car to the upper part of the valve, and the engine will be of 200-horse power.

THE supplementary number, 51, of Petermann's *Mittheilungen* contains the second half of the late E. De Pruyssenaere's travels in the region of the White and Blue Nile. This part contains the special scientific results of the accomplished traveller—meteorological observations, barometrical altitude observations, river measurements, astronomical observations, triangulation of a part of the Jezira, besides the southern half of the map, constructed by the editor, Herr Zöppritz, and a plate of some of the implements, weapons, utensils, ornaments, &c., used by the inhabitants of the region traversed.

AT the meeting of the delegates of the French learned societies to be held at the Sorbonne, as we noticed last week, M. Alluard, the director of the Puy-de-Dôme Observatory, will present a most interesting paper. A self-registering barometer has been kept in constant operation on the top of the Puy-de-Dôme, and another similar instrument was observed at Clermont-Ferrand during the same length of time. The difference of pressure has undergone most remarkable variations, which cannot be accounted for by the Laplace law for determining the altitudes by comparing barometers. The corrections of temperature will be shown to be quite insufficient.

THE Scientific Congress of France, a quite distinct organisation, established by the late M. de Caumont, will hold its forty-third session at Versailles, from May 17 to 27. A number of attractive excursions have been arranged with the help of the municipal authorities, and there will be a floral exhibition.

AT the meeting of the St. Petersburg Society for the Protection of Trade, March 21, the maps prepared last summer by M. Orloff during his journey to the Baydaraksky Gulf, were exhibited. The survey and levelling were made from the Irtysh, up the Shchuchya River, and along the Baydaraka River to the Baydaraksky Gulf. Both rivers are navigable during the three months—June, July, and August.

A TOMSK telegram received by M. Siderof on March 18, from M. Schwanenberg's expedition, announces the find, on the banks of the Obi, near to the Mariinsky gold-washings, of a well-preserved mammoth with flesh and skin. The definitive excavation of the carcass was stopped until instructions should arrive from St. Petersburg.

DR. J. F. BRANSFORD, surgeon in the United States Navy, has been investigating the antiquities on the island of Omotepe, in Lake Nicaragua, collecting large numbers of vases of various kinds, burial urns, ornaments, and other objects for the National Museum at Washington. Among the more important points substantiated by him was the occurrence on the island of at least three successive and distinct bases of prehistoric civilisation, all of them anterior to the present epoch, these being bounded and defined by successive overflows of lava from the volcano. Very great intervals of time elapsed between the eruptions, as is shown by the accumulations of soil that took place on the fresh surface

of the lava from the decomposition of vegetable deposits. No estimate can be made of these eras, but they are believed to carry the period of the earliest overflows back to a very remote antiquity. The objects of these successive layers are very definite and easily recognisable by the practised eye, and highly important deductions in regard to the early civilisation of that region are expected from a critical investigation of the subject. Dr. Bransford has prepared an elaborate report on this subject for presentation to the Navy Department, but, before publishing it, he has obtained permission to revisit the country, and settle some still doubtful points.

A MALVERN correspondent writes that he and many other residents in that part of the country are desirous of having some legislative protection for the eggs of such birds as are mentioned in the Wild Birds' Preservation Act. He wishes to know if there is any society for looking to the interests of wild birds; if so he and others will be glad to subscribe. The Woolhope Field Club used to give rewards for the best collection of birds' eggs, but the rule was altered when the mischief of this course as regards ornithology became evident.

THOSE of our readers who were at the Glasgow meeting of the British Association last autumn will, no doubt, remember the interesting collection which was on view in the City Industrial Museum. The Report of the Museum for 1876 has just been issued, and we are pleased to see that under the management of its Curator, Mr. Paton, it is rapidly increasing in size and importance, and we have no doubt that ere long it will become, what so important a city as Glasgow ought to possess, a really valuable industrial collection arranged on a thoroughly scientific plan.

AT a recent meeting of the French Academy M. de Romilly called attention to some remarkable effects obtained by suspension of water sucked up into a bell jar closed below by a tissue with wide meshes; in one arrangement, the net being metallic the suspended water could even be boiled by heat applied below. M. Plateau has just pointed out that he described this phenomenon of suspension in 1867, in treating of the construction of aquatic arachnida.

*A propos* of the question (which has been disputed) whether toads eat bees, M. Brunet states, in *La Nature*, that going one day into his garden, just before a storm, he found the bees crowding into their hives. About fifty centimetres from the best hive there was a middle-sized toad, which every now and again rose on his fore-legs and made a dart with surprising quickness towards blades of grass. He was found to be devouring bees, which rested on the grass-blades, awaiting their chance to enter the hive. M. Brunet watched till twelve victims had been devoured; he expected the toad's voracity would soon be punished with a sting, but in vain. Objecting to further destruction, he seized the toad by one of his legs and carried him to a bed of cabbage thirty metres off, where he might do real service among the caterpillars, &c. Three days after this, on going out to the hives, he found the same toad (which was easily distinguishable) at its old work. M. Brunet let him swallow only three or four bees, then carried him fifty metres in another direction. Two days later the "wretch" was again found at his post, greedily devouring.

OUR correspondent, "J. H.," in describing the path of the meteor of March 17, as seen by him at Rossall, near Fleetwood, wrote  $\epsilon$  Hydre for  $\alpha$  Hydre. The date of Mr. Ainslie Hollis's letter should have been March 19.

MR. ELLIS asks us to state that in his article on Musical Notation last week, p. 476, col. ii., lines four and five, the readings should be  $A_1 \beta$ ,  $A_2 \text{ss}$ ,  $G_2$ .



large portion of Europe could be graphically presented. We are much gratified to receive an intimation from the *Seewarte* that in future the *Monthly Reports* will be published regularly at the end of the second month after the one to which the Report relates. It would be a great boon if small maps accompanied the Report, showing the mean pressure, temperature, rainfall, and direction of wind, in a manner similar to what is so well done by the United States of America.

**BALL LIGHTNING.**—A very fine display of this interesting meteor was witnessed at Vence, in the south-east of France, on the night of March 21-22, by M. Ed. Blanc, of which an interesting detailed account has just appeared in the *Comptes Rendus* of the French Academy, p. 666. Toward midnight there was observed, about eleven miles north-east of Vence, a large black thundery cloud, in a state of extreme agitation, and continually raising and lowering its position. At the upper part of this cloud three or four balls of fire issued every two minutes, as if from the invisible centre of the cloud, diverging in all directions, and after running a course of from six to eight degrees, broke silently with effulgent brightness. Their apparent diameter, as seen at a distance of eleven miles, was about a degree. They were mostly of a reddish colour, a few, however, being of a yellowish tinge, but all of them assumed a white colour in the act of bursting. Their course, which was horizontal and parallel to the plane of the cloud, was relatively slow, not exceeding two degrees per second, and they bore a strong resemblance to immense soap-bubbles, both as regards apparent lightness and general appearance. From time to time a discharge of lightning passed through the cloud from above downwards, followed some seconds after by a dull rumbling sound. The cloud, with its fine display of fire-balls, took a course from east to west, passing about a league to the north of Vence. The glimmering of the lightning with its low dull thunderous sound continued for more than an hour, after which the sky became darker and darker; rain mixed with hailstones fell, and lightning, accompanied with thunder, furrowed the sky in all directions.

# NOTES

THE President of the Royal Astronomical Society has announced that the Council of that Society have determined to advance the requisite funds to enable Mr. Gill to carry out his projected expedition to the island of Ascension to measure the parallax of Mars at the approaching opposition, in the expectation that they will be aided by Government or out of the Government grant to the Royal Society. At all events the Royal Astronomical Society will not allow the opportunity of making this important observation to be lost. Its duty in the matter was evident, and it has not hesitated for a moment in doing it. Mr. Gill will embark for the island of Ascension towards the end of next month.

SIR ROBERT CHRISTISON, who has been in failing health for some time, has resigned the Chair of Materia Medica in the University of Edinburgh, which he has held with such distinction since the year 1832. Sir Robert, before being appointed to the Chair he has now relinquished, had filled for ten years that of Medical Jurisprudence.

LAST Sunday evening the first of a course of eight lectures to working men on science and literature was delivered at the St. Alban's Schools, Holborn. The lecture was by Mr. R. Bowdler Sharpe, of the British Museum; the subject, "Birds of Prey and their Geographical Distribution." Mr. Mackonochie deserves the hearty thanks of all interested in the welfare of the working classes for having undertaken so liberal an enterprise.

THE Annual Meeting of the Yorkshire College of Science was held at Leeds on the 16th inst. A highly satisfactory report

was presented, in which it was urged that the college should now apply for a charter of incorporation. The great desirability of establishing a classical side in the college was recognised in the report and by the president, Lord F. Cavendish, and other speakers, and there is every reason to hope that in no long time the Yorkshire College will be a flourishing rival of Owens College. The munificence of the Clothworkers' Company deserves all praise and imitation; its last gift to the College is one of 10,000*l*.

DR. JANSSEN has removed his photographic apparatus from the Boulevard Ornano to Meudon, where he is establishing, in barracks given by the French War Office, a permanent physical observatory at the expense of the Government.

ON April 23 next the Paris Academy of Sciences will hold its anniversary meeting for the distribution of prizes. M. Dumas will deliver a lecture on the two brothers Alexander and Adolphe Brogniard, both of them members of the Academy of Sciences. Admiral Paris will be in the chair.

THE Paris Physical Society held its anniversary meeting on April 5. Various apparatus were exhibited, including a number of radiometers, M. Bischoff's gas engine without refrigerator, and a Mouchat reflector for utilising the heat from the sun.

It has been decided by the Committee of the French Sociétés Savants that special warnings should be sent to the coal pits when large depressions are foreseen, in order to suggest precautions against an escape of fire-damp. Many mining engineers believe that the system will be efficacious. Experience will soon settle the question.

THE U.S. Congress having appropriated 18,000 dollars for a Commission to report on the depredations of the Rocky Mountain locusts, the Secretary of the Interior has appointed as members of the Commission Prof. C. V. Riley, Dr. Cyrus Thomas, and Dr. A. S. Packard. The Commissioners have already mapped out their work for the season, and will direct their attention to insect enemies and parasites, mechanical means for the destruction of the pests, geographical distribution, agricultural bearings of the subject, anatomy and embryology, remedial measures and migrations, &c. Bulletins giving the results of the Commission's inquiries will be issued at intervals.

THE opening meeting of the Yorkshire Naturalists' Union (formerly known as the West Riding Consolidated Naturalists' Society) was held at Pontefract on Easter Monday, April 2, and proved a great success in every way. The Union is a confederation of twenty-four Natural History and Scientific Societies in Yorkshire, banded together for the purpose of holding each summer a combined series of excursions and meetings, of investigating the fauna and flora of the country, and of publishing the results. The union is divided into five sections, viz., vertebrate zoology, conchology, entomology, botany, and geology, which work on the principle of the British Association. This plan was tried for the first time at Pontefract, and so far as it went proved a decided success. The towns represented in the Union are Huddersfield (three societies), Heckmondwike, Clayton West, Barnsley, Wakefield, Ovenden, Stainland, Ripponden, Holmfirth, Liversedge, Rastrick, Mirfield, Honley, Middles-town, Paddock, Bradford, Leeds (two societies), Goole, York, Selby, and Sheffield, numbering in the aggregate nearly 1,200 members. The next meeting will be held at Wetherly, on Whit Monday, May 21.

AT the last meeting of the French Anthropological Society, a long report was read which showed that Druidism was not quite extinct in Brittany, some country people still adhering to Pagan practices in spite of the priests' exertions. It was noticed that the clergy were anxious to destroy menhirs and

Mr. Abbay, the rock is limestone, as is proved by its being largely quarried and burned. Moreover, the patena soil in Ouvah is not of the ordinary worthless quality, at any rate in the opinion of planters owning portions of it, as they frequently assert that it is as good as the jungle soil of Dimbula, and the neighbouring districts. What truth there is in this I cannot say.

Further, though cleared forest land when abandoned usually runs into "chena," I could show Mr. Abbay, if he were to return to Ceylon, as I wish he would, cases in which it has run into patena. The Dimbula cricket ground is a case in point.

Pendleton, Manchester, April 17

E. HEELIS

#### Cumming's Electricity

IN a passage from my "Introduction to the Theory of Electricity" which you quote in a review of the work in *NATURE*, vol. xv. p. 526, occurs a very unfortunate misprint of the word *of* for the word *on*, which seems to have misled your reviewer, and I therefore beg a few lines to correct it. The passage in question is the statement of Prop. 8, p. 203, which ought to have been written: "In computing the potential on any closed circuit we may substitute for it any closed circuit which is obtained by projecting the given circuit by means of lines of force."

In defence of this phrase I may perhaps be allowed to point out that the definition of potential quoted by the reviewer as that of Sir William Thomson is not the definition of potential but of *electrostatic potential at a point*, which is given at p. 45 of my book. The phrase potential on an electrified body in a field of electrical force is, I hold, perfectly legitimate, denoting the work done against electrical forces in moving the body (supposing all electrification undisturbed by the movement) to an infinite distance out of the field.

The case in point, however, refers to electro-magnetic potential and the potential on the closed circuit really represents the work done in carrying the circuit against magnetic forces out of the magnetic field.

The phrase suggested in your review—induction through the circuit—I had purposely avoided as liable to be confused with ordinary "magnetic induction" in a mass of magnetic iron, or with the "self-induction" of the circuit, or even with the induced current produced by the movement of the circuit, while the phrase potential on the circuit is at once suggestive of its own meaning and clear from any ambiguity.

Rugby, April 19

L. CUMMING

#### Remarkable Papuan Skull

I WISH to call your attention to a remarkable Papuan skull which Prof. Mantegazza showed at the last meeting of the Anthropological Society of Italy. The upper jaw contained very distinctly no less than four molars and two canine teeth on each side, all the molars being well developed.

Unfortunately the lower jaw is missing, but if it corresponded with the upper jaw, as we may justly presume—the whole skull not showing any abnormality of structure—the total number of teeth would amount to *forty*. There are cases recorded of negro-skulls showing three, four, and five supernumerary teeth, but *eight* is certainly an *extremely rare* occurrence.

It would be interesting to know whether museums or collections in England contain any similar specimens. J. E. Z.

#### Meteor

ABOUT 10.50 P.M. on the night of Monday, the 16th inst., the sky being cloudless and the young moon just setting, I observed a remarkable meteor in the northern heavens. It originated near to the star  $\gamma$  Cephei, and travelled towards the eastern horizon, its path forming an angle of about  $35^\circ$  with the perpendicular. The head, two or three times as large and bright as Venus, was bluish, and left a trail of yellowish light. I took it at first for a falling rocket, whose ascent I had not noticed; but its transient existence, its sudden extinction without noise or sparks, and the straightness of its path, with only a slight zig-zag, but no curve, preclude that explanation I think.

Leicester, April 17

F. T. MOTT

#### OUR ASTRONOMICAL COLUMN

THE U.S. NAVAL OBSERVATORY, WASHINGTON.—Under the title "Instruments and Publications of the United States Naval Observatory," the superintendent has circulated a series of

photographs of the instruments at present in use in that noble astronomical institution. They are taken by the heliotype process, and comprise (1) the mural circle, mounted in 1844, aperture 4'1 inch; the transit instrument, 5'33 inch aperture, mounted in the same year, and placed in the same room beside the mural circle; the smaller equatorial, mounted in 1844, with which so much good work has been performed, aperture 9'62 inch; the transit-circle, by Pistor and Martins, Berlin, which was mounted in 1866, the aperture of the object-glass 8'52 inch, and the focal length 12 feet 1 inch; a general view of the grand 26-inch refractor, of 32 feet 5'8 inch focal length, mounted in 1873, and one of the most powerful telescopes in the world; the clock-work, &c., of this magnificent instrument is shown on a separate plate. Brief descriptions accompany these heliotypes, and in addition are drawings made with the 26-inch equatorial of the nebula in Orion, the omega nebula, the annular nebula in Lyra, and the planet Saturn. Some account of the foundation of the observatory and a list of its publications from 1845-76 precede the brief description of the instruments of which views are presented.

NEW VARIABLE STAR.—A recent number of *M. Leverrier's Bulletin International* contains a notice from MM. Henry respecting a variable star in Virgo, which they state has been under observation for some time. The period is about seven months, and the limits of variation 8m. to 14m.; at present it is near a maximum. The position for 1877.0 is in R.A. 12h. 27m. 32.2s., N.P.D.  $93^\circ 44' 37''$ .

EARLY OBSERVATION OF SOLAR SPOTS.—In our popular astronomical works the Chinese are not usually credited with the observation of spots upon the sun at a distant date. Gaubil, however, records from the Chinese annals that on May 7, 826 black spots were seen on the sun's disc, and again on April 21, 832. There are, indeed, few phenomena which are not noted by this observant people, or rather by their watchful astronomers; yet, strange to say, the zodiacal light is amongst them. And it is singular that while Kepler's star of 1604 is duly recorded, the Chinese annals have no reference to the similar object in 1572, with which the name of Tycho Brahe is commonly associated.

COMET 1877 III.—The comet discovered by M. Borelly at Marseilles, on April 14, appears to have been detected three or four nights earlier by Mr. Lewis Swift, of Rochester, New York, who is already the independent discoverer of more than one of these bodies. We say three or four nights earlier, for although the telegram forwarded to Europe through the Smithsonian Institution dates the observation on the night of April 11, the rough place there assigned agrees more nearly with the computed position for the previous midnight. In circular No. xxv. of the Imperial Academy of Sciences at Vienna, are elements by Dr. Holetschek, from the first three nights' observations, which it is remarked have "a very great resemblance to those of the comet of the year 1762." The following orbit has been calculated by Mr. Hind from the first complete observation at Marseilles, on April 14, one at Mannheim by Prof. Schönfeld, on the 16th, and a third at the observatory of Mr. J. Gurney Barclay, at Leyton, on the 19th. For the sake of comparison the elements of the comet of 1762, calculated by Burckhardt, after a new reduction of the Paris observations, are annexed.

	COMET 1877 III.	COMET 1762.
Perihelion Passage (G.M.T.) ...	April 26.9501	May 28.3345
Long. of Perihelion ... ..	$102^\circ 45' 51''$	$104^\circ 2' 0''$
" Ascending Node ... ..	$345^\circ 53' 18''$	$348^\circ 33' 5''$
Inclination ... ..	$77^\circ 8' 56''$	$85^\circ 38' 13''$
Perihelion Distance ... ..	1.01089	1.00905

The motion is direct. It will be remarked that the only material difference is in the inclination of the orbits to the ecliptic. The comet of 1762 was discovered in the Netherlands, by Klinken-



burg, on May 17, and was observed by Messier and Maraldi at Paris until July 2. When first seen it was just visible to the naked eye. The interval between the perihelion passages is 114.91 years, and with such period of revolution, with the other elements of 1762, the descending node would fall about 0.27 from the orbit of Mars and the ascending node at a radius-vector of 3.35, or in the region occupied by the minor planets; thus the difference of inclination will not be easily explained on the supposition of identity of the comets, though it must be remarked that elements of the present comet founded upon the first few days' observations may be open to more sensible correction than is usually the case.

"THE OBSERVATORY, A MONTHLY REVIEW OF ASTRONOMY."—There is ample room for the new astronomical periodical, which has been launched by Mr. Christie, the First Assistant of the Royal Observatory, Greenwich, under the above title, during the last week. Its aim is to present in a popular form a general survey of the progress of astronomy and to afford early intimation of recent advances. Such a publication ought to be well supported in this country, where astronomical amateurs are in great force. The first number holds out good augury for the future; amongst the contents are a report of the proceedings at the last meeting of the Royal Astronomical Society, proceedings which are not detailed in the *Monthly Notices*, where the discussions following the reading of papers are, as a rule, ignored, but which, as everyone knows who has been in the habit of attending the meetings of our scientific societies, are frequently the most interesting feature in the evening's proceedings; and we hope this point will not be lost sight of in the new periodical. There is an article on the photographic spectra of stars, a subject known to have lately much occupied the attention of the president, by whom it is furnished; the first part of a contribution from Mr. Gill, on the determination of the solar parallax; remarks on the nebular hypothesis, by Mr. Darwin, being an account of an inquiry intended to suggest a cause which may fill up a hiatus in the theory, and an outline of the results of Dr. von Asten's [researches on the motion of Encke's Comet, recently communicated to the St. Petersburg Academy; also, ephemerides for physical observations of the moon and of Jupiter, by Mr. Marth, whose assistance in this direction deserves the high appreciation of observers. We will further express the hope that accuracy of typography may characterise the future numbers of Mr. Christie's publication; it is most important that this should be the case if the confidence of the practical astronomer is to be secured for it, and we are induced to offer this suggestion from remarking one or two inaccuracies in the first number, as on p. 4, where the search for an intra-mercurial planet by the Rev. S. J. Perry is dated in April instead of in March, and on p. 27, where Mr. Swift's discovery of the comet subsequently found by M. Borrelly, is erroneously referred to April 5, which was the date of discovery of the previous comet.

#### THE NEBULÆ—WHAT ARE THEY?\*

BEFORE the announcement of Mr. Huggins's discovery of the presence of bright lines in the spectra of nebulae, it was generally, if not universally, accepted as a fact that nebulae were merely stellar clusters irresolvable on account of their great distances from us. This view had become impressed on the minds of many of our greatest observing astronomers in the progress of their work, and is one therefore which should not lightly be abandoned.

It appears to me that Mr. Huggins's observations instead of being inconsistent with the view formerly held by astronomers, are rather confirmatory of the correctness of that view.

\* On a Cause for the Appearance of Bright Lines in the Spectra of Irresolvable Star Clusters. Paper read at the Royal Society by E. J. Stone, M.A., F.R.S., Her Majesty's Astronomer, Cape of Good Hope.

The sun is known to be surrounded by a gaseous envelope of very considerable extent. Similar envelopes must surround the stars generally. Conceive a close stellar cluster. Each star, if isolated, would be surrounded by its own gaseous envelope. These gaseous envelopes might, in the case of a cluster, form over the whole, or a part of the cluster, a continuous mass of gas. So long as such a cluster was within a certain distance from us the light from the stellar masses would predominate over that of the gaseous envelopes. The spectrum would therefore be an ordinary stellar spectrum. Suppose such a cluster to be removed further and further from us, the light from each star would be diminished in the proportion of the inverse square of the distance; but such would not be the case with the light from the enveloping surface formed by the gaseous envelopes. The light from this envelope received on a slit in the focus of an object-glass would be sensibly constant because the contributing area would be increased in the same proportion that the light received from each part is diminished. The result would be that at some definite distance, and all greater distances, the preponderating light received from such a cluster would be derived from the gaseous envelopes and not from the isolated stellar masses. The spectrum of the cluster would therefore become a linear one, like that from the gaseous surroundings of our own sun. The linear spectrum might, of course, under certain circumstances, be seen mixed up with a feeble continuous spectrum from the light of the stars themselves.

It should be noticed that, in this view of the subject, the linear spectrum can only appear when the resolvability of the cluster is at least injuriously affected by the light of the gaseous envelopes, becoming sensibly proportional to that from the stellar masses, and that in the great majority of such cases it would only be in the light from the irresolvable portions of the cluster that bright lines could be seen in the spectrum.

The changes in form which would be presented to us by such a nebula might be expected to be small. These changes would depend chiefly upon changes in the distribution of the stellar masses constituting the cluster. It has always appeared to me difficult to realise the conditions under which isolated irregular masses of gas, presenting to us sharp angular points, could exist uncontrolled by any central gravitational mass without showing larger changes in form than appear to have been the case with many of the nebulae. In my view of the nature of nebulae this difficulty no longer exists.

#### THE RACES AND TRIBES OF THE CHAD BASIN

ON this subject a most valuable paper has been contributed to the last number of the *Zeitschrift der Gesellschaft für Erdkunde* by Dr. G. Nachtigal, one of the few living writers entitled to speak with authority on the ethnography of Sudan. While the great problems now being rapidly solved in the portion of Africa lying south of the equator are almost exclusively of a strictly geographical nature, those still awaiting solution in the northern half of the Continent are on the contrary mainly of an ethnological character. The reason of this pointed difference is very obvious. Although there are vast regions south of the line still unexplored, enough is already known to warrant the conclusion that what remains to be there discovered is peopled by the same great race holding almost exclusive possession of the parts already opened up by the spirit of modern enterprise. With the sole exception of the extreme south-western corner, occupied by the Namaqua and Cape Hottentots, and of some districts also in the south still haunted by a few straggling Bushman tribes, the whole of Africa from the equator southwards would seem to be the domain of what is now conventionally known to philologists as the Bantu